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## **Pediatric Neurological Examination via Telemedicine**

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**This guide offers an outline and tips for the examination of infants, toddlers, and young children via telemedicine, which is limited to observations. The child neurologist may adapt the examination based on an individual clinical situation and need. Guidelines for the examination of adolescents can be adapted from this tool and the adult telemedicine examination guidelines accessed via the AAN website per the CNS COVID-19 Telemedicine Toolkit.**

**These guidelines can be continuously updated - please reach out to any of the authors via CNS Connect to let us know of your recommended additions or edits!**

### **General principles:**

- Have a plan for the examination, but also plan to be flexible – and creative.
- Intentionally be reassuring and be patient with the caregiver when the child is not cooperating.
- **Remote examinations are mostly observational, so requires ongoing and careful observation of the patient.**
- Save those portions of the examination that might upset the child until the end.
- Demonstrating the task can facilitate success – when examining an infant it may be helpful for the neurologist to have an infant doll.
- **Confirm and document there is appropriate informed consent for telemedicine evaluation.**
- **Document the examination similarly to an in-person visit, explaining or describing any limitations, estimations, or inaccuracies of any portion of the examination, and document who is assisting.**

### **Cannot obtain via telemedicine:**

- Fundoscopic exam – although smartphone fundoscopy technology is available, extensive practice is required to reliably utilize.
- At least partial information can be obtained for the majority of the rest of the examination.

**Consider bringing the patient and family in for an office visit if there are any concerns that an in-person examination is required.**

### Considerations prior to the visit:

- Recommend that the caregiver have the patient in a room with them with their undivided attention for the duration of the clinic visit. Age-appropriate preparation and having an activity for the child during the interview can assist.
- A desktop with a camera can be utilized, but if the child is active may consider using a portable device such as a smartphone, tablet, or a laptop that can follow the patient around.
- Recommend, when possible, that a second caregiver be available to assist.
- Have the availability of an age-appropriate chair to allow caregiver to use both hands if needed. For infants and toddlers, a blanket or mat to observe the patient's activity on the floor.
- Request that the parent obtain a height, weight, and head circumference, or have a recent measurement from other evaluations.
  - For the head circumference, ask the parent to use a tape measure and measure the head at the largest point on the forehead and around the head just above the ear pinna.
  - Web-resource: <https://simulconsult.com/resources/measurement.html?type=head>
- Request that the parent examine the entire skin surface and notate any skin lesions.
- Request the following tools be available:
  - Infant:
    - Shiny or visually interesting toy
    - Rattle or other noise making toy
    - Flashlight or other source of light
  - Toddler:
    - Shiny or visually interesting toy
    - Rattle or other noise making toy
      - A duck sound MP3 for use on a smart phone is also available at <https://segal.org/docs/duck/duck.mp3>
    - Small cereal
    - Toy with a button to push
    - Crayons and paper
    - Soft ball
    - Flashlight or other source of light
  - Child:
    - Shiny or visually interesting toy
    - Noise making toy
    - Crayons or pen/pencil and paper
    - Soft ball, size of tennis ball
    - Cotton swab or soft tool for sensory exam
    - Flashlight or other source of light
    - Handheld pinwheel or piece of paper if chief complaint is staring, seizures, or epilepsy

## **Infant (<12 months):**

### **Mental status**

- Observation for level of alertness, awareness, or interaction with environment.
- Try to get infant's attention/interaction, or observe the interaction of the infant with the caregiver – smile, funny faces, play “peek-a-boo”.

### **CN:**

- Smell typically deferred.
- Visual fields – have caregiver hold a toy 1-2 feet in front of child's face with one hand; with the other hand slowly approach child's peripheral vision from behind and watch for child shifting attention to the new object.
- Vision and EOMS– have parents gently hold child's head, then move a visually interesting toy in all directions. Observe for any nystagmus, dysconjugate movements or failure to track and regard. In very young infants, one person holding the head and the other moving his or her own face in front of the infant may work better.
- Can have parents dim lights, shine light into eyes- can see red reflex and also can observe subtle nystagmus by looking at red reflex. Can consider trying to cover one eye at a time while the patient is looking at the camera.
- Pupils and palate: some platforms allow zooming in; instruct caregivers to try to catch any yawning or crying by bringing the device/camera close.
- Facial symmetry is easy to assess visually, ideally in neutral affect and while smiling/laughing/crying.
- Hearing – assess response to finger rub, then to clicking fingernails, then to rattle, ideally with child initially being focused on a toy in front on them.
- SCM can be assessed by observing the degree of head lag/head control, observing for abnormal head deviation.
- Tongue protrusion may at times be observed during crying; if close-up is possible, try to assess for fasciculations. Older infant may imitate “blowing a raspberry”.

### **Motor:**

- Start with observation, ideally with child sitting in caregiver's lap and while lying on a flat surface - normal infant posture? Or “frog-legged” vs hyperextended.
- Are movements normal and symmetric?
- Have caregiver gently pull on each limb and release – normal recoil response?
- Have them check for scarf sign (gently pull hand across body past the contralateral shoulder – does elbow easily pass the chin?) – demonstrate with doll.
- Check horizontal and vertical suspension (does child “drape” over the caregiver's hand or keep lower extremities extended? Does the child start to slip through the caregiver's hands when held under the axillae? Or does he/she extend legs, or even scissor?) - demonstrate with doll.
- Have caregiver hold child by the trunk and test weight bearing? Does the child do any stepping? Stepping can also be tested by holding child under arms, then holding them with their back to the camera while gently allowing their feet to touch the edge of a table/ bed to see if they will pick up the foot and step up onto the surface.
- Hyperextending at knees and/or ankles?

- For infants > 7 months corrected age: have caregiver hold child in “wheelbarrow position” as if about to creep, but hold hips with hands and observe whether the infant is able to support him/herself.
- If child is able to creep/crawl, observe him/her doing so.
- If the child is already able to stand/cruise, observe cruising and have child walk from one caregiver to the other with one- or two-hand assist. Focus camera on lower extremities.
- Have caregiver offer a toy to the child in midline – make sure camera angle is such that you can observe for premature hand preference and overt tremor/dysmetria. Once child has the toy in his/her grasp, have caregiver try to playfully take the toy away and have them report on any obvious asymmetry.

### **Sensory**

- With child in caregiver’s lap or on a flat surface, have the child focus on a visually interesting toy or noise maker and gently tickle different parts of the body, judging reaction.

### **Cerebellar**

- As for the last item under “motor” – observe for tremor or dysmetria.

### **Reflexes**

- Deep tendon reflexes are difficult or impossible to assess without a skilled examiner present, but primitive and developmental reflexes may be assessed **where appropriate/necessary, and only if they can be done safely (\*)**
- Rooting reflex.
- Moro (demonstrate with doll) \*
- Tonic neck (demonstrate with doll) \*
- Truncal incurvation reflex (Galant) \*
- Palmar and plantar grasp.
- If child is close to being able to sit, observe for anterior and lateral propping reflexes.
- Parachute reflex (demonstrate with doll) \*

Ask the parents to show you any documented skin lesions noted.

## **Toddler (12-36 months):**

**Prepare by making sure that you will be able to place toddler in a safe area after examination is complete like a play pen/ infant seat where they can be belted- so as to continue discussion with provider.**

### **Mental status**

- Observation for level of alertness, awareness, or interaction with environment.
- Try to get toddler's attention or observe the interaction of the toddler with the caregiver – smile, funny faces, play “peek-a-boo”, ask questions about who is in the room.

### **CN:**

- Similar to infant testing. If toddler appears to be developmentally normal will also follow commands to look towards mommy/ daddy (right /left), “show me all your teeth”, “roar like a lion” (open mouth).
- Vision and EOMS– have parents play a game of moving a toy in front of the child's face where patient can only look but not touch.
- Asking child to look at something also tests joint attention.
- Pupils and palate: some platforms allow zooming in; instruct caregivers to try to catch yawning or crying by bringing the device/camera close; can have parents dim lights, shine light into eyes - can see red reflex and also can observe subtle nystagmus by looking at red reflex.
- Facial symmetry is easy to assess visually, ideally in neutral affect and while smiling/laughing/crying.
- Hearing – assess response to finger rub, then to clicking fingernails, then to rattle, ideally with child initially being focused on a toy in front on them.
- SCM can be assessed by observing the degree of head lag/head control/abnormal head deviation.
- Tongue protrusion may at times be observed during crying; if close-up is possible, try to assess for fasciculations. Older infant may imitate “blowing a raspberry”.

### **Motor:**

- Ask parental permission to watch them play (parent can train phone camera onto the child).
- One easy way to look at motor strength is have toddlers do the chicken dance (tests deltoids by inspection) /sing “head- shoulders-knees-and-toes” while touching body parts- tests strength as well as coordination.
- Have child sit on ground and then get up to get keys from parent (watch for Gower).
- Watch for tremor while reaching a toy/ building block tower.
- May require modifications, utilize available toys to supplement the examination.

### **Sensory**

- Can only be performed with help of someone with patient.
- Have the child focus on a visually interesting toy or noise maker and gently tickle different parts of the body, judging reaction. Differentiate left and right, proximal or distal, medial and lateral.

### **Cerebellar**

- Check finger-to-nose, or how they reach out to grab a toy.

- See them walk and assess if broad-based or not.

**Reflexes**

- Difficult without a skilled examiner present.
- Ask the parents to show you any documented skin lesions noted.

### **Child (3-10 years):**

**Prep by making sure that you will be able to place child in safe area after examination is complete so as to continue discussion with provider.**

### **Mental status**

- The mental status exam can for the most part be obtained similarly via a telemedicine visit as in person.
- Observations and interactions with the child can provide information concerning mood, affect, organization and content of thoughts, speech and language (rate, volume, prosody, syntax, grammar, and vocabulary), non-verbal communication, social skills and reciprocity, behavior (attentiveness, impulsiveness, activity level), and other psychiatric symptoms and signs.

### **CN:**

- Smell is typically deferred.
- Pupillary reactions can be determined by having the patient close to the camera, and having them open and close their eyes. Alternatively, the caregiver can dim the lights and shine a light alternatively into each eye. Can also see red reflex and observe subtle nystagmus by looking at red reflex. Caregiver can assist in cover/uncover testing of the eyes.
- Visual fields can be assessed on screen using an interesting toy or other object or with the help of someone with the patient. Older children can be asked to follow in all directions to assess extraocular movements. Fatigability can be assessed by asking the child to look up at the ceiling with their eyes for a minute and then looking at the examiner.
- The face should be observed throughout the visit and the patient can be asked to mimic the examiner's facial expressions such as smiling or frowning to assess facial symmetry.
- Hearing – assess response to finger rub, then to clicking fingernails, then to a louder noise such as a toy.
- The shoulder shrug and neck turning from side to side can be assessed with subjective quantification by the caregiver.
- Tongue protrusion can also be assessed visually through mimicking the examiner.
- If able to get a close-up the palate should be observed raising and the tongue should be observed for fasciculations resting in the oral cavity.

### **Motor:**

- May require modifications, and grading can be objectively assessed through antigravity; partial resistance to antigravity movements and full resistance may need to be more subjective based on report.
- Start by asking the parent to allow the examiner to visually assess the arms and legs for asymmetric bulk.
- Look for obvious signs of weakness in the arms such as asymmetric movements and look for subtle signs of weakness by assessing for pronator drift, slowed finger taps, or decreased arm swing while walking.

- Assess the legs first by observation then by asking the child to stand on each leg for 3 seconds and then squat down and back up with both legs. Then ask them to sit down with legs crossed, and arise to a stand as quickly as they can without using their arms.
- Tone will be difficult to assess but to see evidence of obvious spasticity, ask the parent to flex and extend the arms at the elbow back and forth a few times, looking for visual evidence of a spastic catch.
- Observe for tremors and other hyperkinetic adventitious movements.
- Ask the child to draw a picture to assess fine motor and visual skills.
- Assess for myotonia as needed by asking the child to squeeze their caregivers hand for 5 seconds as hard as they can and then let go quickly.
- For older children, ask them to walk normally, then up on their toes and then their heels, and then pretend to walk on a tight rope/balance beam, heel to toe.

### **Sensory**

- Can only be performed with help of someone with patient, and will still be limited.
- For younger children, the reaction to the parent tickling the skin may be the best information to obtain: the caregiver can be asked to tickle the patient's skin using a cotton swab to elicit any difference left and right, proximal or distal.
- For older children, the caregiver can be asked to touch the patient's skin to elicit any difference left and right, proximal or distal or different dermatome, and older children may be able to draw a line around the area that is numb to get a general distribution.

### **Cerebellar**

- Check finger to object movements or observe as the child reaches for interesting toys or objects.
- Observe the child's gait.

### **Reflexes**

- Difficult without a skilled examiner present.

### **Other**

- Ask the parents to show you any documented skin lesions noted.
- If the patient is being assessed for staring spells or seizures, consider coaching a hyperventilating test by asking the parent to tear a piece of paper and ask the patient to take deep breaths and blow on the paper to make it move for 2 minutes.

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